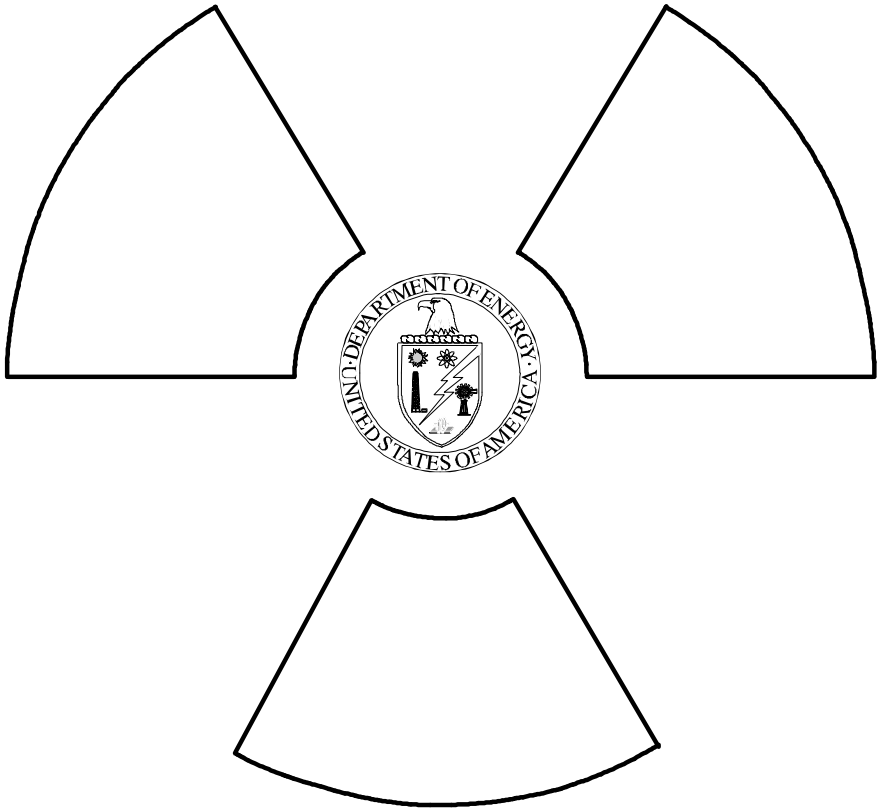
G-10 CFR 835/B1 - Rev. 1
SEPTEMBER 1994

IMPLEMENTATION GUIDE

For Use With

Title 10, Code of Federal Regulations, Part 835
OCCUPATIONAL RADIATION PROTECTION



RADIATION PROTECTION PROGRAM

**ASSISTANT SECRETARY for ENVIRONMENT,
SAFETY and HEALTH**

U.S. Department of Energy
IMPLEMENTATION GUIDE

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U.S. Department of Energy
Implementation Guide

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I. PURPOSE AND APPLICABILITY

This Implementation Guide (IG) provides an acceptable methodology for documenting the development of an occupational radiation protection program (RPP) that will comply with U.S. Department of Energy (DOE) requirements specified in Title 10 of the Code of Federal Regulations (CFR), Part 835, Occupational Radiation Protection *(DOE, 1993a)*; hereinafter referred to as 10 CFR 835. For completeness, this IG also identifies applicable requirements and recommendations contained in DOE Order 5480.11, as amended, Radiation Protection for Occupational Workers *(DOE, 1992)*, and DOE's Radiological Control Manual *(DOE, 1994a)*; hereinafter referred to as the RCM (with the associated numbers denoting the article numbers).

This IG amplifies the regulatory requirements of 10 CFR 835, which are enforceable under the provisions of Sections 223(c) and 234A of the Atomic Energy Act of 1954, as amended *(AEC, 1954)*. The requirements and recommendations of the other DOE documents are enforceable through contractual or administrative means.

Except for requirements mandated by regulation, contract, or administrative means, the provisions in this IG are DOE's views on acceptable methods of program implementation and are not mandatory. Conformance with this guide will, however, create an inference of compliance with the related regulatory requirements. Alternate methods that are demonstrated to provide an equivalent or better level of protection are acceptable. Contractors are encouraged to go beyond the minimum requirements and to pursue excellence in their programs.

The word "shall" is used in this IG to designate requirements from 10 CFR 835, DOE Orders, and the RCM. The requirements of 10 CFR 835 are mandatory except to the extent an exemption has been granted pursuant to 10 CFR 820, Procedural Rules for DOE Nuclear Activities *(DOE, 1993b)* and are identified by a bolded and underlined "**shall**." Requirements taken from DOE Orders and the RCM are mandatory to the extent they are invoked by a contract or through administrative means.

Those facilities not subject to the requirements of 10 CFR 835 should substitute the corresponding DOE 5480.11 requirements.

This IG is applicable to all DOE activities involving occupational exposure to ionizing radiation of DOE employees and/or DOE-

contractor/subcontractor employees.

II. DEFINITIONS

DOE activity: An activity taken for or by DOE that has the potential to result in the occupational exposure of an individual to radiation or radioactive material. The activity may be, but is not limited to, design, construction, operation, or decommissioning. To the extent appropriate, the activity may involve a single DOE facility or operation, or a combination of facilities and operations, possibly including an entire site.

radiation protection program: The documented program including, but not limited to, the plans, schedules, and other measures developed and implemented to achieve and ensure compliance with 10 CFR 835 and to apply the ALARA process to occupational exposure.

III. DISCUSSION

10 CFR 835 requires that DOE activities involving occupational radiation exposure **shall** be conducted in compliance with a documented radiation protection program as approved by DOE (10 CFR 835.101(a)). Effective occupational radiation protection programs ensure that the health and safety of the work force are adequately protected by maintaining individual and collective radiation doses below regulatory limits and by implementing a process that seeks doses that are as low as is reasonably achievable (ALARA). The documented RPP includes the programs, plans, procedures, schedules, and other measures undertaken to ensure worker health and safety through compliance with 10 CFR 835.

For 10 CFR 835, the documented RPP also fulfills the role of the document commonly referred to as an "Implementation Plan" in

other DOE regulations. The guidance provided in this IG is intended to be fully consistent with the requirements for Implementation Plans required for other DOE regulations.

For the most part, the requirements of 10 CFR 835 are not new. Equivalent requirements were previously promulgated in DOE Order 5480.11 and the RCM, which have been implemented (or scheduled for implementation) under contractual obligations for most activities. Therefore, much of the RPP documentation required to ensure compliance with 10 CFR 835 has been previously developed (or planned) to ensure compliance with contractually-imposed radiation protection standards. DOE recognizes that significant effort has been expended in upgrading radiological protection of the work force and does not intend for its contractors to expend significant additional effort in the development and implementation of a separate, redundant program to satisfy the RPP requirements of 10 CFR 835. Existing documents, including the site-specific radiological control manual, RCM Implementation Plan, contractual agreements, procedures, and memoranda, can be used to satisfy the 10 CFR 835 requirements for a documented RPP. However, the completeness of this documentation should be verified to ensure that all 10 CFR 835 requirements are satisfied.

Appendix A of this IG provides a checklist that cross-references 10 CFR 835 requirements with site-specific provisions that document compliance with those requirements. For completeness and ease of use, additional columns contain related provisions from the RCM. Appendix A thus serves as a tool to assist the user and reviewer in verifying that a documented RPP exists which satisfies the requirements of 10 CFR 835.

Note that Appendix A (or an equivalent verification checklist) may be used to verify the completeness and summarize the documentation of the RPP. This does not indicate that Appendix A is the RPP. The RPP consists of those documents (or portions of documents) that ensure regulatory compliance, as specified in the site-specific provision column of Appendix A.

It is not DOE's intent to review and approve all documents that constitute an activity's documented RPP. Rather, DOE intends to review the activity's compliance verification, such as Appendix A, indicating that a sufficient RPP exists and will be implemented. Based upon that review and knowledge of existing conditions and initiatives, DOE may find that reasonable assurance exists that implementation of the documented RPP ensures that all 10 CFR 835 requirements will be met. Future regulatory compliance inspections will provide a verification of this finding.

IV. IMPLEMENTATION GUIDANCE

The RPP documentation should reflect the programmatic requirements for accomplishing 10 CFR 835 required objectives. In recognition of the fact that, as a result of previous initiatives, elements of the RPP substantially exist for most activities, and to avoid replication of previous efforts to develop and implement formalized programs, DOE recommends that RPP consistency with 10 CFR 835 requirements be verified and documented by completing Appendix A of this IG, or an equivalent verification checklist. The following sections discuss the material pertinent to 10 CFR 835 compliance that should be considered in RPP development, documentation, and verification.

A. RPP Content

The RPP **shall** address, but not necessarily be limited to, each requirement of 10 CFR 835 (10 CFR 835.101(e)). To assist in verifying that all 10 CFR 835 requirements are incorporated into the RPP, Appendix A provides a detailed breakdown of these requirements. Cross-references to the RCM are provided to facilitate the identification of existing program elements that may be appropriate for inclusion in the RPP.

Column 1 of Appendix A provides a detailed delineation of 10 CFR 835 requirements. Additional columns are provided which identify related RCM provisions. Column 2 identifies RCM provisions that are similar or identical to the corresponding 10 CFR 835 requirement. Column 3 identifies RCM provisions that support the regulatory requirements and provisions in Columns 1 and 2, respectively. In other words, Columns 1 and 2 generally identify what must be done; Column 3 generally identifies acceptable (or contractually required) methods for accomplishing the provisions identified in Columns 1 and 2. By referring to Columns 2 and 3, the user can identify existing (or planned) contractually required provisions in site-specific documents that should be considered for inclusion in the documented RPP to meet the corresponding regulatory requirement in Column 1.

Column 4 of Appendix A is provided for the user to identify the site-specific documents, or specific portions of documents, that have been developed, approved by cognizant management, and implemented to ensure compliance with the corresponding 10 CFR 835 requirement. These documents may include procedures, the site-specific radiological control manual, contractual obligations, memoranda, or other activity documents. Due to the regulatory enforcement mechanisms associated with the RPP, references to site-specific documents should be made as detailed as is necessary to ensure that individuals reviewing the RPP can clearly distinguish those provisions that are intended to be included in the RPP.

Since the provisions and implementation schedules for 10 CFR 835 and the RCM are closely linked, correlation of related regulatory and contractual provisions should assist the user in coordinating implementation of the RCM and compliance with 10 CFR 835. By identifying existing site-specific provisions, the user can avoid duplication of effort and concentrate efforts upon establishing programs to ensure timely compliance with unmet regulatory requirements.

Note that the RCM provisions referenced in Appendix A, while sometimes identical to the corresponding regulatory requirements, may not in all cases fully satisfy the related 10 CFR 835 provision or fully reflect site-specific provisions necessary to ensure compliance. In other cases, the referenced RCM provisions may go well beyond the corresponding regulatory requirements. These differences arise out of the different purposes and audiences for which 10 CFR 835 and the RCM were developed. For these reasons, the RCM provisions listed in Appendix A should be considered supporting material only. IMPLEMENTATION OF THESE PROVISIONS SHOULD NOT BE CONSIDERED A GUARANTEE OF COMPLIANCE.

Despite these differences, the RCM is intended to be consistent with all relevant regulatory requirements. DOE remains committed to implementation of the RCM and believes that measures taken to implement the RCM will concurrently support compliance with 10 CFR 835.

In addition to the RCM provisions identified in Appendix A, other IGs provide detailed guidance concerning methods acceptable to DOE for the development and

implementation of various program elements to meet 10 CFR 835 requirements. The other IGs also provide a cross-reference of the material contained therein and the controlling regulatory and contractual requirements. These IGs should also be used in developing the RPP. It is incumbent upon the cognizant management of each activity to ensure that the RPP documentation adequately addresses all applicable 10 CFR 835 requirements. DOE expects RPP development and approval to be an iterative process, requiring significant coordination and communication between the contractors and cognizant Program Offices.

It may appear to be expeditious to simply endorse the entire site-specific radiological control manual as documentation of the RPP. If the site-specific radiological control manual addresses all of the 10 CFR 835.101 required material, then this would be one possible course of action. However, site-specific radiological control manuals generally contain far more detail than that required for RPPs by 10 CFR 835. Given the 10 CFR 835.101(a) requirement to conduct activities in compliance with the approved RPP, any violations of a site-specific radiological control manual that had been approved as part of the RPP, including violations of those provisions not specifically required by 10 CFR 835, would become subject to enforcement under 10 CFR 835.101(a). In addition, endorsement of the entire site-specific radiological control manual as documentation of the RPP would make that manual and any subsequent revisions subject to DOE approval, pursuant to 10 CFR 835.101(a and h). This would preempt RCM Article 114, which states that DOE approval of the site-specific radiological control manual is not required.

Notwithstanding the above, DOE remains committed to excellence in radiological controls as embodied in full implementation of the RCM. However, DOE recognizes that the RCM provides both basic minimum requirements and provisions that go beyond these requirements in the "pursuit of excellence." Basic minimum requirements have been published in 10 CFR 835 and are therefore subject to regulatory enforcement mechanisms. Those provisions that have been developed in the pursuit of excellence have been omitted from 10 CFR 835 and are not subject to regulatory enforcement mechanisms unless they are committed to in an activity's documented RPP.

Some of the material extracted from 10 CFR 835 and provided in Appendix A consists solely of titular or introductory material and does not clearly impose any requirements upon the user. In these cases, the corresponding site-specific provision blocks have been shaded to indicate that no provision must be developed or listed. Note that the site-specific provision blocks corresponding to the regulatory definitions have not been shaded. Although the definitions generally do not establish any true requirements, the use of definitions different from those published in 10 CFR 835 could result in non-compliance. Therefore, there is a need for assurance that the meaning of a term used in the RPP documentation is consistent with its meaning in 10 CFR 835. This assurance may be provided by simply issuing a management policy endorsing the regulatory definitions or by referencing equivalent definitions in site-specific documents.

Some requirements established by 10 CFR 835 are applicable only when specific options are exercised by the user. These provisions can generally be identified by the use of the word "may." For example, 10 CFR 835.204 requirements for planned special exposures and 10 CFR 835.1101(c) requirements for use of contaminated materials outside of

radiological areas take effect only if cognizant managers exercise their prerogative to implement these options. These requirements may be judged to have no effect upon the RPP if activity managers determine that the subject options will not be enacted. In such cases, a brief statement explaining the intent to avoid such circumstances may be provided in the site-specific provision block corresponding to that regulatory provision. Any changes to these policies will require an RPP revision to address the affected regulatory provision.

The content of the RPP **shall** be commensurate with the nature of the activities performed and **shall** include formal plans and measures for applying the ALARA process to occupational exposure (10 CFR 835.101(c)). Measures undertaken to apply the ALARA process may go beyond the previously discussed measures that simply seek compliance with individual 10 CFR 835 requirements. To this end, the RPP documentation should include additional information regarding implementation of the ALARA process.

Implementation Guide G-10 CFR 835/B2, Occupational ALARA Program *(DOE, 1994b)*, identifies the critical elements of an occupational ALARA program and should serve as a basis for development and documentation of the ALARA provisions of the RPP. However, as acknowledged in RCM Article 115, measures necessary to implement the ALARA process vary widely between facilities due to the wide variety of activities undertaken by DOE. Therefore, more specific guidance regarding ALARA provisions to be included in RPP documentation must be developed in coordination with the cognizant Program Office. Documents that implement such measures should be listed in the site-specific provision block corresponding to 10 CFR 835.101(c) in Appendix A, or an equivalent verification checklist.

The RPP **shall** include plans, schedules, and other measures for achieving compliance with 10 CFR 835 by January 1, 1996 (10 CFR 835.101(f)). These plans, schedules, and other measures may include:

- -- Incorporating changes in facilities as needed to ensure 10 CFR 835 compliance;
- -- implementing additional administrative controls, or interim compensatory measures;
- -- incorporating changes in work controls, training, procedural controls, record-keeping systems, and contractual agreements;
- -- implementing changes in organizations, facilities, procedures, and reporting/record-keeping systems; and
- -- other measures necessary to achieve compliance on or before January 1, 1996.

These materials should be referenced in the site-specific provision block corresponding to 10 CFR 835.101(f).

Inclusion of the required plans and schedules for achieving compliance in the RPP documentation does not relieve management of the responsibility for achieving compliance by January 1, 1996. Should factors exist which appear to preclude compliance with any 10 CFR 835 provision by the stated deadline, then application for an exemption to that requirement should be considered. Such applications should be submitted in accordance with 10 CFR 820 in a timely manner to ensure resolution before the compliance deadline. Exemptions can be

referenced in the applicable site-specific provision block(s) of Appendix A. DOE approval of the RPP documentation does not indicate approval of any application(s) for exemptions. These applications can only be approved through the processes established in 10 CFR 820.

Management approval and submittal of the RPP verification to DOE before the January 1, 1995 deadline allows sufficient time for review and resolution of any comments arising from that review prior to the January 1, 1996 compliance deadline.

The RPP **shall** specify existing and anticipated operational tasks (site activities) intended to be within its scope and include information commensurate with the nature of site activities (10 CFR 835.101(c) and (d)). A brief narrative should be appended to the RPP verification checklist summarizing the scope and nature of the activities conducted under the RPP. This narrative should be referenced in the site-specific provision block corresponding to 10 CFR 835.101(d).

Any radiological work activities not subject to RPP requirements should be specified. Regulatory requirements that need no corresponding RPP provisions due to the nature of the covered activities need not be addressed, other than to include a brief explanation of the omission. For instance, an activity that uses only a low-activity sealed radioactive source need not stipulate very high radiation area control measures. A brief explanation in Appendix A, such as, "No very high radiation areas associated with this activity," would be appropriate.

At some facilities, the potential exists for individuals to conduct work subject to two different RPPs in the same area. Due to the confusion that could result, DOE continues to support the development of single, site-wide RPPs, as discussed in the preamble to 10 CFR 835. In the event that overriding factors exist that preclude development of a single, site-wide RPP, efforts should be made to maximize consistency between the RPPs in order to eliminate inconsistencies in areas where applicability of the RPPs overlaps. In any case, individuals are expected to conduct their work in accordance with the provisions of the RPP applicable to their tasks.

B. RPP Approval

For an existing activity, documentation of the RPP **shall** be submitted to the responsible DOE Program Office for approval no later than January 1, 1995 (10 CFR 835.101(g)). The completed verification matrix and appended narrative material, as suggested in this IG, should form an adequate basis for documentation of the RPP. Activity managers should coordinate with the cognizant Program Office to determine the nature and scope of the material necessary and sufficient to demonstrate adequate implementation of 10 CFR 835 to the satisfaction of the approving authority.

DOE may make changes to the RPP or direct that such changes be made (10 CFR 835.101(b)). During the conduct of RPP documentation reviews, assessments, and/or compliance evaluations, DOE may determine that RPP revisions are necessary to:

-- Achieve regulatory compliance within the deadlines established by 10 CFR 835;

-- ensure implementation of the ALARA process; or

-- ensure application of the RPP to all operational tasks that should be within its scope.

Under these or other conditions determined appropriate, DOE may require or institute RPP changes. DOE will expect cognizant activity

managers to reflect RPP changes in site-specific documents in a timely manner, as necessary to ensure effective implementation of the RPP.

C. RPP Revision

An update of the RPP documentation **shall** be submitted to DOE:

-- When a change or addition is made to the RPP (10 CFR 835.101(h)(1));

-- prior to initiation of a task not within the scope of the RPP (10 CFR 835.101(h)(2)); and

-- within 180 days of the effective date of any modification to 10 CFR 835 (10 CFR 835.101(h)(3)).

RPP changes may be implemented without prior DOE approval only if the RPP continues to meet 10 CFR 835 requirements and the changes do not reduce program effectiveness (10 CFR 835.101(i)). However, DOE reserves the right to modify or rescind RPP changes. In any case, DOE encourages coordination and consultation with the cognizant Program Office to eliminate possible questions concerning RPP changes.

Due to the wide range of activities subject to 10 CFR 835 requirements and the variety of methods used by these activities to ensure compliance, no specific criteria exist by which DOE may predetermine whether an RPP change results in a reduction in program effectiveness. Factors which should be considered include the impact of the proposed change(s) on:

-- Radiological conditions in occupied areas;

-- individual and collective doses;

-- worker awareness of radiological conditions and controls;

-- management oversight and control of routine and non-routine radiological work activities;

-- sufficiency of area and personnel monitoring programs;

-- completeness and retrieveability of records;

-- radiological performance indicators;

-- adherence to consensus standards; and

-- other factors that ensure full implementation of the RPP.

Documentation of the rationale applied to RPP changes implemented without prior DOE approval should be retained for future reference and demonstration of compliance.

It is possible that the RPP could change (perhaps as a result of a revision to a site-specific document) without incurring a corresponding visible change to Appendix A, or an equivalent checklist. The absence of a visible change to the verification checklist does not relieve activity management of the responsibilities mandated by 10 CFR 835.101 (h & i) to evaluate the effect of the RPP change, submit documentation of the change to DOE, and seek DOE approval when required. Although there is no requirement to develop or maintain a verification checklist, maintenance of Appendix A or a similar checklist will provide activity management and DOE an assurance that all applicable 10 CFR 835 requirements continue to be addressed in the RPP.

V. REFERENCES

(AEC, 1954) U.S. Atomic Energy Act of 1954, as amended. Public Law 83-703 (68 Stat. 919), Title 42 U.S.C. sec. 2011.

(DOE, 1992) U. S. Department of Energy. 1992. Radiation Protection for Occupational Workers. DOE Order 5480.11. Washington, D.C.

(DOE 1993a) U. S. Department of Energy. 1993. Occupational Radiation Protection. 10 CFR 835, 58 FR 65458, *Federal Register*, Vol. 58, No. 236: December 14, 1993. Washington, D.C.

(DOE 1993b) U. S. Department of Energy. 1993. Procedural Rules for DOE Nuclear Activities. 10 CFR 820, 58 FR 43680, *Federal Register*, Vol. 58, No. 157: August 17, 1993. Washington, D.C.

(DOE, 1994a) U. S. Department of Energy. 1994. Radiological Control Manual. DOE/EH-0256T. Washington, D.C.

(DOE 1994b) U. S. Department of Energy. 1994. Occupational ALARA Program. G-10 CFR 835/B2. July 1994. Washington, D.C.

APPENDIX A
Cross-Reference of 10 CFR 835 to Site-Specific Provisions and to the DOE Radiological Control Manual

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
Subpart A - General Provisions **§ 835.1 Scope.**			
(a) *General.* The rules in this part establish radiation protection standards, limits, and program requirements for protecting individuals from ionizing radiation resulting from the conduct of DOE activities.			
(b) *Exclusion.* The requirements in this part do not apply to:			
(1) Activities that are regulated through a license by the Nuclear Regulatory Commission or a State under an Agreement with the Nuclear Regulatory Commission, including activities certified by the Nuclear Regulatory Commission under section 1701 of the Atomic Energy Act;			
(2) Activities conducted under the authority of the Director, Naval Nuclear Propulsion Program, as described in Public Law 98-525;			
(3) Activities conducted under the Nuclear Explosives and Weapons Safety Program relating to the prevention of accidental or unauthorized nuclear detonations; or			
(4) Background radiation, radiation doses received as a patient for the purposes of medical diagnosis or therapy, or radiation doses received from voluntary participation in medical research programs.			
§ 835.2 Definitions. (a) As used in this part:			
Airborne radioactive material or airborne radioactivity means radioactive material in any chemical or physical form that is dissolved, mixed, suspended, or otherwise entrained in air.	Glossary: airborne radioactivity		
Airborne radioactivity area means any area where the measured concentration of airborne radioactivity, above natural background, exceeds or is likely to exceed 10 percent of the derived air concentration (DAC) values listed in appendix A or appendix C of this part.	Glossary: airborne radioactivity area		

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
ALARA means "As Low As is Reasonably Achievable," which is the approach to radiation protection to manage and control exposures (both individual and collective) to the work force and to the general public to as low as is reasonable, taking into account social, technical, economic, practical, and public policy considerations. As used in this part, ALARA is not a dose limit but a process which has the objective of attaining doses as far below the applicable limits of this part as is reasonably achievable.	Glossary: As Low As Reasonably Achievable		
Ambient air means the general air in the area of interest (e.g., the general room atmosphere), as distinct from a specific stream or volume of air that may have different properties.			
Annual limit on intake (ALI) means the derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year by the reference man (ICRP Publication 23) that would result in a committed effective dose equivalent of 5 rem (0.05 sievert) or a committed dose equivalent of 50 rem (0.5 sievert) to any individual organ or tissue. ALI values for intake by ingestion and inhalation of selected radionuclides are based on Table 1 of the U.S. Environmental Protection Agency's Federal Guidance Report No. 11, Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion, published September 1988. This document is available from the National Technical Information Service, Springfield, VA.	Glossary: annual limit on intake (ALI)		
Background means radiation from: (i) Naturally occurring radioactive materials which have not been technologically enhanced; (ii) Cosmic sources; (iii) Global fallout as it exists in the environment (such as from the testing of nuclear explosive devices); (iv) Radon and its progeny in concentrations or levels existing in buildings or the environment which have not been elevated as a result of current or prior activities; and (v) Consumer products containing nominal amounts of radioactive material or producing nominal amounts of radiation.	Glossary: background radiation		
Bioassay means the determination of kinds, quantities, or concentrations, and, in some cases, locations of radioactive material in the human body, whether by direct measurement or by analysis, and evaluation of radioactive materials excreted or removed from the human body.	Glossary: bioassay		

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Calibration means to adjust and/or determine either: (i) The response or reading of an instrument relative to a standard (e.g., primary, secondary, o tertiary) or to a series of conventionally true values; or (ii) The strength of a radiation source relative to a standard (e.g., primary, secondary, or tertiary) or conventionally true values.	Glossary: calibration		
Contamination area means any area where contamination levels are greater than the values specified in appendix D of this part, but less than or equal to 100 times those levels.	Glossary: contamination area		
Continuous air monitor (CAM) means an instrument that continuously samples and measures the levels of airborne radioactive materials on a "real-time" basis and has alarm capabilities at preset levels.	Glossary: continuous air monitor (CAM)		
Contractor means any entity under contract with the Department of Energy with the responsibility to perform activities at a DOE site or facility.			
Controlled area means any area to which access is managed in order to protect individuals from exposure to radiation and/or radioactive material. Individuals who enter only the controlled area without entering radiological areas are not expected to receive a total effective dose equivalent of more than 100 mrem (0.001 sievert) in a year.	Glossary: controlled area		
Declared pregnant worker means a woman who has voluntarily declared to her employer, in writing, her pregnancy for the purpose of being subject to the occupational exposure limits to the embryo/fetus as provided in § 835.206. This declaration may be revoked, in writing, at any time by the declared pregnant worker.	Glossary: declared pregnant worker		
Derived air concentration (DAC) means, for the radionuclides listed in appendix A of this part, the airborne concentration that equals the ALI divided by the volume of air breathed by an average worker for a working year of 2000 hours (assuming a breathing volume of 2400 m^3). For the radionuclides listed in appendix C of this part, the air immersion DACs were calculated for a continuous, non-shielded exposure via immersion in a semi-infinite atmospheric cloud. The value is based upon the derived airborne concentration found in Table 1 of the U.S. Environmental Protection Agency's Federal Guidance Report No. 11, Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion, published September 1988. This document is available from the National Technical Information Service, Springfield, VA.	Glossary: derived air concentration (DAC)		

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
DOE activities means an activity taken for or by the DOE that has the potential to result in the occupational exposure of an individual to radiation or radioactive material. The activity may be, but is not limited to, design, construction, operation, or decommissioning. To the extent appropriate, the activity may involve a single DOE facility or operation or a combination of facilities and operations, possibly including an entire site.	Glossary: DOE activity		
Entrance or access point means any location through which an individual could gain access to areas controlled for the purposes of radiation protection. This includes entry or exit portals of sufficient size to permit human entry, irrespective of their intended use.	Glossary: entrance or access point		
General employee means an individual who is either a DOE or DOE contractor employee; an employee of a subcontractor to a DOE contractor; or a visitor who performs work for or in conjunction with DOE or utilizes DOE facilities.	Glossary: general employee		
High contamination area means any area where contamination levels are greater than 100 times the values specified in appendix D of this part.	Glossary: high contamination area		
High radiation area means any area, accessible to individuals, in which radiation levels could result in an individual receiving a deep dose equivalent in excess of 0.1 rem (0.001 sievert) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.	Glossary: high radiation area		
Individual means any human being.			
Member of the public means an individual who is not occupationally exposed to radiation or radioactive material. An individual is not a "member of the public" during any period in which the individual receives occupational exposure.	Glossary: public		
Minor means an individual less than 18 years of age.	Table 2-1		
Monitoring means actions intended to detect and quantify radiological conditions.	Glossary: monitoring		
Nonstochastic effects means effects due to radiation exposure for which the severity varies with the dose and for which a threshold normally exists (e.g., radiation-induced opacities within the lens of the eye).			

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Occupational exposure means an individual's exposure to ionizing radiation (external and internal) as a result of that individual's work assignment. Occupational exposure does not include planned special exposures, exposure received as a medical patient, background radiation, or voluntary participation in medical research programs.	Glossary: occupational dose		
Person means any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, Government agency, any State or political subdivision of, or any political entity within a State, any foreign government or nation or other entity, and any legal successor, representative, agent or agency of the foregoing; provided that person does not include the Department or the United States Nuclear Regulatory Commission.			
Radiation means ionizing radiation: alpha particles, beta particles, gamma rays, X-rays, neutrons, high-speed electrons, high-speed protons, and other particles capable of producing ions. Radiation as used in this part, does not include non-ionizing radiation, such as radio- or micro-waves, or visible, infrared, or ultraviolet light.	Glossary: radiation or ionizing radiation		
Radiation area means any area accessible to individuals in which radiation levels could result in an individual receiving a deep dose equivalent in excess of 0.005 rem (0.05 millisievert) in 1 hour at 30 centimeters from the source or from any surface that the radiation penetrates.	Glossary: radiation area		
Radiological area means any area within a controlled area which must be posted as a "radiation area," "high radiation area," "very high radiation area," "contamination area," "high contamination area," or "airborne radioactivity area" in accordance with § 835.603.	Glossary: radiological area		
Radiological worker means a general employee whose job assignment involves operation of radiation producing devices or working with radioactive materials, or who is likely to be routinely occupationally exposed above 0.1 rem (0.001 sievert) per year total effective dose equivalent.	Glossary: radiological workers		
Representative, as applied to the sampling of radioactive material, means sampling in such a manner that the sample closely approximates both the amount of activity and the physical and chemical properties of the material (e.g., particle size and solubility in the case of air sampling of the aerosol to which workers may be exposed).	Glossary: representative sample		
Stochastic effects means malignant and hereditary diseases for which the probability of an effect occurring, rather than its severity, is regarded as a function of dose without a threshold for radiation protection purposes.			

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Cross-Reference of 10 CFR 835 to Site-Specific Provisions and to the DOE Radiological Control Manual

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
Survey means an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other sources of radiation. When appropriate, such an evaluation includes a physical survey of the location of radioactive material and measurements or calculations of levels of radiation, or concentrations or quantities of radioactive material present.	Glossary: survey		
Very high radiation area means any area accessible to individuals in which radiation levels could result in an individual receiving an absorbed dose in excess of 500 rads (5 grays) in one hour at 1 meter from a radiation source or from any surface that the radiation penetrates.	Glossary: very high radiation area		
Year means the period of time beginning on or near January 1 used to determine compliance with the provisions of this part. The starting date of the year used to determine compliance may be changed provided that the change is made at the beginning of the year and that no day is omitted or duplicated in consecutive years.	Glossary: year		
(b) As used in this part to describe various aspects of radiation dose:			
Absorbed dose (D) means the energy absorbed by matter from ionizing radiation per unit mass of irradiated material at the place of interest in that material. The absorbed dose is expressed in units of rad (or gray) (1 rad = 0.01 gray).	Glossary: dose (absorbed dose)		
Collective dose means the sum of the total effective dose equivalent values for all individuals in a specified population. Collective dose is expressed in units of person-rem (or person-sievert).	Glossary: dose (collective dose)		
Committed dose equivalent ($H_{T,50}$) means the dose equivalent calculated to be received by a tissue or organ over a 50-year period after the intake of a radionuclide into the body. It does not include contributions from radiation sources external to the body. Committed dose equivalent is expressed in units of rem (or sievert).	Glossary: dose (committed dose equivalent)		
Committed effective dose equivalent ($H_{E,50}$) means the sum of the committed dose equivalents to various tissues in the body ($H_{T,50}$), each multiplied by the appropriate weighting factor (w_T)--that is, $H_{E,50} = \Sigma w_T H_{T,50}$. Committed effective dose equivalent is expressed in units of rem (or sievert).	Glossary: dose (committed effective dose equivalent)		
Cumulative total effective dose equivalent means the sum of the total effective dose equivalents recorded for an individual for each year of employment at a DOE or DOE contractor site or facility, effective January 1, 1989.	Glossary: dose (cumulative total effective dose equivalent)		

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
Deep dose equivalent means the dose equivalent derived from external radiation at a depth of 1 cm in tissue.	Glossary: dose (deep dose equivalent)		
Dose equivalent (H) means the product of absorbed dose (D) in rad (or gray) in tissue, a quality factor (Q), and other modifying factors (N). Dose equivalent is expressed in units of rem (or sievert) (1 rem = 0.01 sievert).	Glossary: dose (dose equivalent)		
Effective dose equivalent (H_E) means the summation of the products of the dose equivalent received by specified tissues of the body (H_T) and the appropriate weighting factor (w_T)--that is, $H_E = \Sigma w_T H_T$. It includes the dose from radiation sources internal and/or external to the body. The effective dose equivalent is expressed in units of rem (or sievert).	Glossary: dose (effective dose equivalent)		
External dose or exposure means that portion of the dose equivalent received from radiation sources (e.g., "external sources") outside the body.	Glossary: dose (external dose or exposure)		
Extremity means hands and arms below the elbow or feet and legs below the knee.	Glossary: extremity		
Internal dose or exposure means that portion of the dose equivalent received from radioactive material taken into the body (e.g., "internal sources")	Glossary: dose (internal dose or exposure)		
Lens of the eye dose equivalent means the external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 cm.	Glossary: dose (lens of the eye dose equivalent)		
Quality factor means the principal modifying factor used to calculate the dose equivalent from the absorbed dose; the absorbed dose (expressed in rad or gray) is multiplied by the appropriate quality factor (Q). (i) The quality factors to be used for determining dose equivalent in rem are shown below:	Glossary: dose (quality factor)		

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COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
QUALITY FACTORS Radiation Type — Quality Factor X-rays, gamma rays, positrons, electrons (including tritium beta particles) — 1 Neutrons, ≤ 10 keV — 3 Neutrons, > 10 keV — 10 Protons and singly-charged particles of unknown energy with rest mass greater than one atomic mass unit — 10 Alpha particles and multiple-charged particles (and particles of unknown When spectral data are insufficient to identify the energy of the neutrons, a quality factor of 10 shall be used.			

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
(ii) When spectral data are sufficient to identify the energy of the neutrons, the following mean quality factor values may be used: **QUALITY FACTORS FOR NEUTRONS** [Mean quality factors, $\bar{Q}$ (maximum value in a 30-cm dosimetry phantom), and values of neutron flux density that deliver in 40 hours, a maximum dose equivalent of 100 mrem (0.001 sievert).]	Article 128.1		

NEUTRON ENERGY (MeV)	MEAN QUALITY FACTOR	NEUTRON FLUX ($cm^{-2}s^{-1}$)
2.5×10^{-8} thermal	2	680
1×10^{-7}	2	680
1×10^{-6}	2	560
1×10^{-5}	2	560
1×10^{-4}	2	580
1×10^{-3}	2	680
1×10^{-2}	2.5	700
1×10^{-1}	7.5	115
5×10^{-1}	11	27
1	11	19
2.5	9	20
5	8	16
7	7	17
10	6.5	17
14	7.5	12
20	8	11
40	7	10
60	5.5	11
1×10^{2}	4	14
2×10^{2}	3.5	13
3×10^{2}	3.5	11
4×10^{2}	3.5	10

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<table>
<tr><th>COLUMN 1</th><th>COLUMN 2</th><th>COLUMN 3</th><th>COLUMN 4</th></tr>
<tr><th>10 CFR Part 835</th><th>DOE RCM
Direct References</th><th>DOE RCM
Supporting
References</th><th>Site-Specific Provision
(e.g., Site RCM or
Procedure)</th></tr>
<tr><td><u>Shallow dose equivalent</u> means the dose equivalent deriving from external radiation at a depth of 0.007 cm in tissue.</td><td>Glossary: dose (shallow dose equivalent)</td><td></td><td></td></tr>
<tr><td><u>Total effective dose equivalent (TEDE)</u> means the sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures). For purposes of compliance with this part, deep dose equivalent to the whole body may be used as effective dose equivalent for external exposures.</td><td>Glossary: dose (total effective dose equivalent (TEDE))</td><td></td><td></td></tr>
<tr><td><u>Weighting factor</u> (w_T) means the fraction of the overall health risk, resulting from uniform, whole body irradiation, attributable to specific tissue (T). The dose equivalent to tissue, T, is multiplied by the appropriate weighting factor to obtain the effective dose equivalent to that tissue. The weighting factors are as follows:

WEIGHTING FACTORS FOR VARIOUS TISSUES

<table>
<tr><th>Organs or tissues, T</th><th>Weighting factor, w_T</th></tr>
<tr><td>Gonads</td><td>0.25</td></tr>
<tr><td>Breasts</td><td>0.15</td></tr>
<tr><td>Red bone marrow</td><td>0.12</td></tr>
<tr><td>Lungs</td><td>0.12</td></tr>
<tr><td>Thyroid</td><td>0.03</td></tr>
<tr><td>Bone surfaces</td><td>0.03</td></tr>
<tr><td>Remainder[1]</td><td>0.30</td></tr>
<tr><td>Whole body[2]</td><td>1.00</td></tr>
</table>
[1] "Remainder" means the five other organs or tissues with the highest dose (e.g., liver, kidney, spleen, thymus, adrenal, pancreas, stomach, small intestine, and upper large intestine). The weighting factor for each remaining organ or tissue is 0.06.

[2] For the case of uniform external irradiation of the whole body, a weighting factor (w_T) equal to 1 may be used in the determination of the effective dose equivalent.</td><td>Glossary: dose (weighting factor)
Appendix 2B</td><td></td><td></td></tr>
</table>

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COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
Whole body means, for the purposes of external exposure, head, trunk (including male gonads), arms above and including the elbow, or legs above and including the knee.	Glossary: dose (whole body)		
(c) Terms defined in the Atomic Energy Act and not defined in this part are used consistent with the meanings given in the Act.			
(d) As used in this part, words in the singular also include the plural and words in the masculine gender also include the feminine and vice versa, as the case may be.			
§ 835.3 General rule.			
(a) No person or DOE personnel shall take or cause to be taken any action inconsistent with the requirements of: (1) This part; or (2) Any program, plan, schedule, or other process established by this part.		Article 113.1 Article 156	
(b) With respect to a particular DOE activity, contractor management shall be responsible for compliance with the requirements of this part.		Article 112.1 & 2	
(c) Where there is no contractor for a DOE activity, DOE shall ensure implementation of and compliance with the requirements of this part.		Article 156	
(d) Nothing in this part shall be construed as limiting actions that may be necessary to protect health and safety.			
§ 835.4 Radiological units.			
Unless otherwise specified, the quantities used in the records required by this part shall be clearly indicated in special units of curie, rad, or rem, including multiples and subdivisions of these units. The SI units, becquerel (Bq), gray (Gy), and sievert (Sv), are only provided parenthetically in this part for reference with scientific standards. These SI units are not authorized for use in records required under this part.			
Subpart B--Radiation Protection Programs **§ 835.101 Radiation protection programs.**			
(a) A DOE activity shall be conducted in compliance with a documented radiation protection program (RPP) as approved by the DOE.	Article 112.1	Article 114.1 & 5	

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
(b) The DOE may direct or make modifications to a RPP.			
(c) The content of each RPP shall be commensurate with the nature of the activities performed and shall include formal plans and measures for applying the as low as reasonably achievable (ALARA) process to occupational exposures.		Article 114.2 Article 115.2 Article 138	
(d) The RPP shall specify the existing and/or anticipated operational tasks that are intended to be within the scope of the RPP. Except as provided in § 835.101(i), any task outside the scope of a RPP shall not be initiated until an update of the RPP is approved by DOE.			
(e) The content of the RPP shall address, but shall not necessarily be limited to, each requirement in this part.		Article 114.1	
(f) The RPP shall include plans, schedules, and other measures for achieving compliance with regulations of this part. Compliance with this part shall be achieved no later than January 1, 1996.			
(g) The RPP for an existing activity shall be submitted to the DOE no later than January 1, 1995.			
(h) An update of the RPP shall be submitted to DOE: (1) Whenever a change or an addition to the RPP is made; (2) Prior to the initiation of a task not within the scope of the RPP; or (3) Within 180 days of the effective date of any modifications to this part.			
(i) Changes, additions, or updates to the RPP may become effective without prior Department approval only if the changes do not decrease the effectiveness of the RPP and the RPP, as changed, continues to meet the requirements of this part. Proposed changes that decrease the effectiveness of the RPP shall not be implemented without submittal to and approval by the Department.			
(j) An initial RPP or an update shall be considered approved 180 days after its submission unless rejected by DOE at an earlier date.			
§ 835.102 Internal Audits			
Internal audits of all functional elements of the radiation protection program shall be conducted no less frequently than every 3 years and shall include program content and implementation.	Article 134.1	Article 134.2 - 5	

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COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
Subpart C--Standards for Internal and External Exposure **§ 835.202 Occupational exposure limits for general employees.**			
(a) The occupational exposure to general employees resulting from DOE activities, other than planned special exposures under § 835.204 and emergency exposure situations under § 835.1302, shall be controlled so the following annual limits are not exceeded:	Chapter 2, Part 1 (Specific cross-references noted below)		
(1) A total effective dose equivalent of 5 rems (0.05 sievert); (2) The sum of the deep dose equivalent for external exposures and the committed dose equivalent to any organ or tissue other than the lens of the eye of 50 rems (0.5 sievert); (3) A lens of the eye dose equivalent of 15 rems (0.15 sievert); and (4) A shallow dose equivalent of 50 rems (0.5 sievert) to the skin or to any extremity.	Article 213.1	Article 211 Article 213.5 Article 216 Table 2-1	
(b) All occupational exposure received during the current year shall be included when demonstrating compliance with § 835.202(a).	Article 213.1	Article 213.2.c Article 721	
(c) Exposures from background, therapeutic and diagnostic medical radiation, and voluntary participation in medical research programs shall not be included in dose records or in the assessment of compliance with the occupational exposure limits.	Table 2-1, Note 3	Article 316.2 Article 724.4	
§ 835.203 Combining internal and external dose equivalents resulting from DOE activities.			
(a) The total effective dose equivalent during a year shall be determined by summing the effective dose equivalent from external exposures and the committed effective dose equivalent from intakes during the year. For purposes of compliance with this part, deep dose equivalent to the whole body may be used as effective dose equivalent for external exposures.	Glossary: dose (total effective dose equivalent)		
(b) Determinations of the effective dose equivalent shall be made using the weighting factor values provided in § 835.2.	Table 2-1, Note 1		
(c) For the case of uniform external irradiation of the whole body, a weighting factor (w_T) equal to 1 may be used in the determination of the effective dose equivalent.	Appendix 2B, Note 3		

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COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
§ 835.204 Planned special exposures.			
(a) A planned special exposure may be authorized for a radiological worker to receive doses in addition to and accounted for separately from the doses received under the limits specified in § 835.202(a), provided that each of the following conditions is satisfied: (1) The planned special exposure is considered only in an exceptional situation when alternatives that might prevent a radiological worker from exceeding the limit in § 835.202(a)(1) are unavailable or impractical;	Article 213.3	Article 722.12 Article 723.1	
(2) The contractor management (and employer, if the employer is not the contractor) specifically requests the planned special exposure, in writing; and	Article 213.3.a		
(3) Joint written approval from the appropriate DOE Headquarters program office and the Assistant Secretary for Environment, Safety and Health is received.	Article 213.3.b		
(b) Prior to requesting an individual to participate in an authorized planned special exposure, the individual's dose from all previous planned special exposures and all doses in excess of the occupational dose limits shall be determined.		Article 213.3 Article 721	
(c) An individual shall not receive a planned special exposure that, in addition to the doses determined in § 835.204(b), would result in a dose exceeding the following: (1) A total effective dose equivalent of 5 rems (0.05 sievert) in the current year; and (2) A cumulative total effective dose equivalent of 25 rems (0.25 sievert).		Article 213.3	
(d) Prior to a planned special exposure, written consent shall be obtained from each individual involved. Each individual shall be: (1) Informed of the purpose of the planned operations and procedures to be used; (2) Informed of the estimated doses and associated potential risks and specific radiological conditions and other hazards which might be involved in performing the task; and (3) Instructed in the measures to be taken to keep the dose ALARA considering other risks that may be present.		Article 213.3 Article 722.10 Article 725.4.g & 5	
(e) Records of the conduct of a planned special exposure shall be maintained and a written report submitted within 30 days after the planned special exposure to the approving organizations identified in § 835.204(a)(3).	Article 722.12 Article 781.4	Article 213.3 Article 723.1 Article 725.4.g & 5 Article 742	

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
(f) The dose from planned special exposures is not to be considered in controlling future occupational dose of the individual under § 835.202(a), but is to be included in records and reports required under this part.	Article 722.12 Article 781.4	Article 213.3 Article 722.1 - 3 Article 723.1	
§ 835.205 Determination of compliance for non-uniform exposure of the skin.			
(a) Non-uniform exposures of the skin from X-rays, beta radiation, and/or radioactive material on the skin are to be assessed as specified in this section. (b) For purposes of demonstrating compliance with § 835.202(a)(4), assessments shall be conducted as follows:	Appendix 2C		
(1) *Area of skin irradiated is 100 cm^2 or more.* The non-uniform dose equivalent received during the year shall be averaged over the 100 cm^2 of the skin receiving the maximum dose, added to any uniform dose equivalent also received by the skin, and recorded as the shallow dose equivalent to any extremity or skin for the year.	Appendix 2C	Article 541 Article 721 Article 722 Article 723.1	
(2) *Area of skin irradiated is 10 cm^2 or more, but is less than 100 cm^2.* The non-uniform dose equivalent (H) to the irradiated area received during the year shall be added to any uniform dose equivalent also received by the skin and recorded as the shallow dose equivalent to any extremity or skin for the year. H is the dose equivalent averaged over the 1 cm^2 of skin receiving the maximum absorbed dose, D, reduced by the fraction f, which is the irradiated area in cm^2 divided by 100 cm^2 (i.e., H = fD). In no case shall a value of f less than 0.1 be used.	Appendix 2C	Article 541 Article 721 Article 722 Article 723.1	
(3) *Area of skin irradiated is less than 10 cm^2.* The non-uniform dose equivalent shall be averaged over the 1 cm^2 of skin receiving the maximum dose. This dose equivalent shall: (i) Be recorded in the individual's occupational exposure history as a special entry; and (ii) Not be added to any other shallow dose equivalent to any extremity or skin recorded as the dose equivalent for the year.	Appendix 2C	Article 541 Article 721 Article 722 Article 723.1	
§ 835.206 Limits for the embryo/fetus.			
(a) The dose equivalent limit for the embryo/fetus from the period of conception to birth, as a result of occupational exposure of a declared pregnant worker, is 0.5 rem (0.005 sievert).	Article 213.1 Article 215.2.a Table 2-1	Article 723.3	
(b) Substantial variation above a uniform exposure rate that would satisfy the limits provided in § 835.206(a) shall be avoided.	Article 215.2.b		

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
(c) If the dose equivalent to the embryo/fetus is determined to have already exceeded 0.5 rem (0.005 sievert) by the time a worker declares her pregnancy, the declared pregnant worker shall not be assigned to tasks where additional occupational exposure is likely during the remaining gestation period.	Article 215.3		
§ 835.207 Limits for minors.			
Any minor exposed to radiation and/or radioactive material during direct on-site access at a DOE site or facility shall not exceed 0.1 rem (0.001 sievert) total effective dose equivalent in a year.	Article 213.1 Table 2-1		
§ 835.208 Limits for members of the public entering a controlled area.			
Any member of the public exposed to radiation and/or radioactive material during direct on-site access at a DOE site or facility shall not exceed 0.1 rem (0.001 sievert) total effective dose equivalent in a year.	Article 213.1 Table 2-1		
§ 835.209 Concentrations of radioactive material in air.			
(a) The derived air concentration (DAC) values given in appendices A and C to this part shall be used in the control of occupational exposures to airborne radioactive material.	Article 223.2 Article 555.2 & 3	Glossary: derived air concentration (DAC) Article 235.3 Article 316	
(b) With regard to inhalation exposures and external exposures from airborne radionuclides, compliance with this part shall be demonstrated through conformity with § 835.101 and § 835.202 which establishes the applicable regulatory limits.	Article 213.1 Table 2-1	Article 316	
(c) The estimation of internal dose shall be based on bioassay data rather than air concentration values unless bioassay data are: (1) unavailable; (2) inadequate; or (3) internal dose estimates based on representative air concentration values are demonstrated to be as or more accurate	Article 521.2	Article 521 Article 522 Article 523 Article 543	

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
Subpart E--Monitoring in the Workplace **§ 835.401 General requirements.**			
(a) Monitoring of individuals and areas shall be performed to:			
(1) Demonstrate compliance with the regulations in this part;	Article 511.1 Article 514.1 Article 521.1 Article 551.1	Article 511.2 Article 521.3 & 4 Article 522.5 Article 541.1 Article 551 - 555	
(2) Document radiological conditions in the workplace;	Article 514.1 Article 551.1 Article 711	Article 514.3 Article 551.3, 7 & 8 Article 552.1 & 3 Article 553.1, 3 & 4 Article 554.1 Article 555.1 - 3	
(3) Detect changes in radiological conditions;	Article 514.3 Article 551.7 & 8	Article 551.1 Article 553.5 Article 554.8 Article 555.1 & 3	
(4) Detect the gradual buildup of radioactive material in the workplace; and		Article 551.1 Article 554.1, 7 & 8	
(5) Verify the effectiveness of engineering and process controls in containing radioactive material and reducing radiation exposure.	Article 551.1	Article 314.3 & 4 Article 334.5 Article 347.2 & 4 Article 551.4, 6 & 11 Article 552.3 Article 553.3	

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
(b) Area monitoring in the workplace shall be routinely performed, as necessary, to identify and control potential sources of personnel exposure to radiation and/or radioactive material.	Article 514.1 & 3 Article 551.1 Article 552.2	Article 334.5 Article 342.1 Article 551.3, 6 & 7 Article 552.1 - 3 Article 553.1 & 5 Article 554.1 & 8 Article 555.1 - 3	
(c) Instruments used for monitoring and contamination control shall be: (1) Periodically maintained and calibrated on an established frequency of at least once per year;	Article 555.5 Article 562.3	Article 562.1 & 2 Article 563	
(2) Appropriate for the type(s), levels, and energies of the radiation(s) encountered;	Article 562.1	Article 562.2 & 6	
(3) Appropriate for existing environmental conditions; and	Article 562.4	Article 562.6	
(4) Routinely tested for operability.	Article 551.2 & 5	Article 553.4 Article 555.7 Article 562.5	
§ 835.402 Individual monitoring.			
(a) For the purpose of monitoring individual exposures to external radiation, personnel dosimetry shall be provided to and used by:			
(1) Radiological workers who, under typical conditions, are likely to receive one or more of the following: (i) An effective dose equivalent to the whole body of 0.1 rem (0.001 sievert) or more in a year;	Article 511.1.a & 2	Article 511.3 - 6	
(ii) A shallow dose equivalent to the skin or to any extremity of 5 rems (0.05 sievert) or more in a year;	Article 511.1.a	Article 511.3 - 6	
(iii) A lens of the eye dose equivalent of 1.5 rems (0.015 sievert) or more in a year;	Article 511.1.a	Article 511.3 - 6	
(iv) A deep dose equivalent from external exposures to any organ or tissue other than the lens of the eye of 5 rems (0.05 sievert);	Article 511.1.a	Article 511.3 - 6	

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
(2) Declared pregnant workers who are likely to receive from external sources a dose equivalent to the embryo/fetus in excess of 10 percent of the applicable limit in § 835.206; or	Article 511.1.b	Article 511.3 - 6	
(3) Minors and members of the public likely to receive, in 1 year, from external sources, a dose in excess of 50 percent of the applicable limits in §§ 835.207 and 835.208, respectively; or	Article 511.1.c	Article 511.3 - 6	
(4) Individuals entering a high or very high radiation area.	Article 334.3.c Article 334.4	Article 511.3 - 6	
(b) Personnel external dosimetry programs shall be adequate to demonstrate compliance with § 835.202, including routine dosimeter calibration and conformance with the requirements of the DOE Laboratory Accreditation Program for Personnel Dosimetry.	Article 512.1 & 2 Article 722.1	Article 511 Article 512.3 - 6	
(c) For the purpose of monitoring individual exposures to internal radiation, internal dose evaluation programs (including routine bioassay programs) shall be conducted for:			
(1) Radiological workers who, under typical conditions, are likely to receive 0.1 rem (0.001 sievert) or more committed effective dose equivalent, and/or 5 rems (0.05 sievert) or more committed dose equivalent to any organ or tissue, from all occupational radionuclide intakes in a year;	Article 521.1.a	Article 521.2 - 5 Article 542.3 Article 543	
(2) Declared pregnant workers likely to receive an intake resulting in a dose equivalent to the embryo/fetus in excess of 10 percent of the limit stated in § 835.206; and	Article 521.1.b	Article 521.2 - 5 Article 542.3 Article 543	
(3) Minors and members of the public who are likely to receive, in 1 year, an intake resulting in a committed effective dose equivalent in excess of 50 percent of the limits stated in §§ 835.207 and 835.208, respectively.	Article 521.1.c	Article 521.2 - 5 Article 542.3 Article 543	
(d) Internal dose evaluation programs shall be adequate to demonstrate compliance with § 835.202.	Article 522.1 Article 722.1	Article 521 Article 522.2 - 9 Article 523	

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COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
§ 835.403 Area monitoring.			
(a) Measurements of radioactivity concentrations in the ambient air of the workplace shall be performed as follows:			
(1) Air sampling shall be performed in occupied areas where, under typical conditions, an individual is likely to receive an annual intake of 2 percent or more of the specified ALI values. For a given radionuclide and lung retention class, the ALI is the product of the DAC listed in appendix A of this part and the constant 2.4×10^9 ml. Samples shall be taken as necessary to detect and evaluate the level or concentration of airborne radioactive material at work locations.	Article 555.2 & 4	Article 316.6.b Article 555.1 & 3	
(2) Real-time air monitoring, using continuous air monitors as defined in § 835.2, shall be performed in normally occupied areas where an individual is likely to be exposed to a concentration of airborne radioactivity exceeding 1 DAC as specified in appendix A of this part or where there is a need to alert potentially exposed individuals to unexpected increases in airborne radioactivity levels.	Article 555.3	Article 316.6.b	
(3) For the airborne radioactive material that could be encountered, real-time air monitors shall have alarm capability and sufficient sensitivity to alert potentially exposed individuals that immediate action is necessary in order to minimize or terminate inhalation exposures.	Article 555.6	Article 555.5 & 7 Article 562.5	
(b) Monitoring of radiation in the workplace shall be performed using stationary (area) or portable radiation instruments, or a combination thereof. The instruments shall be readily available and shall be capable of measuring ambient radiation dose rates for the purpose of controlling radiation exposures.	Article 551.1 & 5 Article 552.4 Article 553.1	Article 514 Article 553.2 - 6	
§ 835.404 Radioactive contamination control and monitoring.			
(a) Instruments and techniques used for radioactive contamination monitoring and control shall be adequate to ensure compliance with the requirements specified in this section.		Article 551.1 & 3 Article 554.3 - 8	

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
(b) Appropriate controls shall be maintained and verified which prevent the inadvertent transfer of removable contamination to locations outside of radiological areas under normal operating conditions	Article 337.1 - 4	Article 341.1 & 2 Article 342.1 - 4 Article 347.1 - 4 Article 348 Article 371.4 Article 372.1 & 3 Appendix 3C Appendix 3D	
(c) Any area in which contamination levels exceed the values specified in appendix D of this part shall be: (1) Posted in accordance with § 835.603; and	Article 235.1	Article 348.4	
(2) Controlled in a manner commensurate with the physical and chemical characteristics of the contaminant, the radionuclides present, and the fixed and removable contamination levels.		Article 222.1 - 7 Article 312 Article 322 Article 325 Article 335 Article 337	
(d) Areas with fixed contamination exceeding the total radioactivity values specified in appendix D of this part may be located outside of radiological areas provided the following conditions are met: (1) Removable contamination levels are below the levels specified in appendix D of this part; (2) Unrestricted access to the area is not likely to cause any individual to receive a total effective dose equivalent in excess of 0.1 rem (0.001 sievert) in a year; (3) The area is routinely monitored; (4) The area is clearly marked to alert personnel of the contaminated status; (5) Appropriate administrative procedures are established and exercised to maintain contro of these areas; and (6) Dose rates do not exceed levels which would require posting in accordance with § 835.603.	Article 222.3, 4 Article 235.4 Table 2-4		
(e) Entry control pursuant to § 835.501 and posting pursuant to § 835.603 are not required for areas with fixed contamination meeting the conditions of § 835.404(d).	Article 222.5		

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
(f) Appropriate monitoring to detect and prevent the spread of contamination shall be performed by individuals exiting radiological areas established to control removable contamination and/or airborne radioactivity.	Article 221.1 Article 335.3.b Article 338.7	Article 347.2 - 4 Article 348.5 Article 372.2 Appendix 3D	
(g) Protective clothing shall be required for entry to areas in which removable contamination exists at levels exceeding those specified in appendix D to this part.	Article 325.1.b Article 335.1 & 2	Article 347.2 - 4 App. 3C, Table 3-1	
Subpart F--Entry Control Program **§ 835.501 Radiological areas.**			
(a) Personnel entry control shall be maintained for each radiological area.	Article 334.2 & 10 Article 335.8		
(b) The degree of control shall be commensurate with existing and potential radiological hazards within the area.	Appendix 3B Article 222.5 Article 237.3 Article 334.2		
(c) One or more of the following methods shall be used to ensure control:	Chapter 2, Part 3		
(1) Signs and barricades;	Article 231.9 & 10 Article 337.1		
(2) Control devices on entrances;	Article 334.2 Appendix 3B		
(3) Conspicuous visual and/or audible alarms;	Appendix 3B		
(4) Locked entrance ways; or	Article 334.2 Appendix 3B		
(5) Administrative controls.	Article 334.10 Article 335.8 Article 341		

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
(d) Administrative procedures shall be written as necessary to demonstrate compliance with the provisions of this section. These administrative procedures shall include actions essential to ensure the effectiveness and operability of barricades, devices, alarms, and locks. Authorizations shall be required to perform specific work within the area and shall include specific radiation protection measures.	Article 322.1 - 5 & 9 Article 334.10 Article 335.8		
(e) No control(s) shall be installed at any radiological area exit that would prevent rapid evacuation of personnel under emergency conditions.	Article 231.10 Appendix 3B, Note 3		
§ 835.502 High and very high radiation areas.			
(a) High radiation areas. One or more of the following features shall be used for each entrance or access point to a high radiation area where radiation levels exist such that an individual could exceed a deep dose equivalent to the whole body of 1 rem (0.01 sievert) in any one hour at 30 centimeters from the source or from any surface that the radiation penetrates:	Appendix 3B		
(1) A control device that prevents entry to the area when high radiation levels exist or upon entry causes the radiation level to be reduced below that level defining a high radiation area;	Appendix 3B		
(2) A device that functions automatically to prevent use or operation of the radiation source or field while personnel are in the area;	Appendix 3B		
(3) A control device that energizes a conspicuous visible or audible alarm signal so that the individual entering the high radiation area and the supervisor of the activity are made aware of the entry;	Appendix 3B		
(4) Entryways that are locked. During periods when access to the area is required, positive control over each entry is maintained;	Appendix 3B		
(5) Continuous direct or electronic surveillance that is capable of preventing unauthorized entry;	Appendix 3B Article 553.6		
(6) A control device that will automatically generate audible and visual alarm signals to alert personnel in the area before use or operation of the radiation source and in sufficient time to permit evacuation of the area or activation of a secondary control device that will prevent use or operation of the source.	Appendix 3B		

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
(b) *Very high radiation areas.* In addition to the above requirements, additional measures shall be implemented to ensure individuals are not able to gain access to very high radiation areas when dose rates are in excess of the posting requirements of § 835.603(c).	Article 334.5 Appendix 3B		
(c) No control(s) shall be established in a high or very high radiation area that would prevent rapid evacuation of personnel.	Article 231.10 Appendix 3B		
Subpart G--Posting and Labeling **§ 835.601 General requirements.**	Chapter 2, Part 3 Posting (Additional, specific cross-references noted below)		
(a) Working areas that require posting because of the presence, or potential presence, of radiation and/or radioactive material are delineated in the subsequent paragraphs of this section. Radioactive items or containers of radioactive materials, shall be individually labeled if adequate warning is not provided by control measures and required posting.	Article 412.1	Article 412.2 - 5 Article 431	
(b) DOE approved signs, labels, and radiation symbols shall be used to identify areas specified in this subpart.	Article 231.2 Article 412.3		
(c) Required signs and labels shall have a yellow background. The radiation symbol shall be black or magenta.	Article 231.2 Article 412.3		
(d) Signs required by this subpart shall be clear and conspicuously posted and may include radiological protection instructions.	Article 231.3	Table 2-3 Table 2-4	
(e) The posting requirements in this section may be modified to reflect the special considerations of DOE activities conducted at private residences. Such modifications shall provide the same level of protection to individuals as the existing provisions in this section.	Article 371		

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
§ 835.602 Controlled areas.	Article 232 (Specific cross-references noted below)		
(a) Each access point to a controlled area (as defined in § 835.2) shall be posted, identifying it as a controlled area, whenever radioactive material and/or radiation fields which would require posting under § 835.603 may be present in the area.	Article 232.1	Article 233.1 - 4 Glossary: controlled area	
(b) Signs used for this purpose may be selected by the contractor to avoid conflict with local security requirements.	Article 232.2		
§ 835.603 Radiological areas.	Articles 234, 235 (Additional, specific cross-references noted below)		
Each access point to a radiological area (as defined in § 835.2) shall be posted with conspicuous signs bearing the wording provided in this section.	Article 231.3 Article 234.1 Article 235.1		
(a) *Radiation Area*. The words "Caution, Radiation Area" shall be posted at any area accessible to individuals in which radiation levels could result in an individual receiving a deep dose equivalent in excess of 0.005 rem (0.05 millisievert) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.	Article 234.1	Article 234.2 - 7	
(b) *High Radiation Area*. The words "Danger, High Radiation Area" shall be posted at any area accessible to individuals in which radiation levels could result in an individual receiving a deep dose equivalent in excess of 0.1 rem (0.001 sievert) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.		Figure 2-1	
(c) *Very High Radiation Area*. The words "Grave Danger, Very High Radiation Area" shall be posted at any area accessible to individuals in which radiation levels could result in an individual receiving an absorbed dose in excess of 500 rads (5 grays) in one hour at 1 meter from a radiation source or from any surface that the radiation penetrates.		Table 2-3 Article 552	
(d) *Airborne Radioactivity Area*. The words "Caution, Airborne Radioactivity Area" shall be posted for any occupied area in which airborne radioactivity levels exceed, or are likely to exceed, 10 percent of the DAC value listed in appendix A or appendix C of this part.	Article 235.1	Table 2-4 Figure 2-1 Article 235.2 - 4 Article 555	

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
(e) *Contamination Area*. The words "Caution, Contamination Area" shall be posted where contamination levels exceed values listed in appendix D of this part, but are less than or equa to 100 times those values.	Article 235.1	Table 2-4 Figure 2-1 Article 235.2 - 4	
(f) *High Contamination Area*. The words "Danger, High Contamination Area" shall be posted where contamination levels are greater than 100 times the values listed in appendix D of this part.			
Subpart H--Records **§ 835.701 General provisions.**	Chapter 7 (Additional, specific cross-references noted below)		
(a) Records shall be maintained to document compliance with this part and with radiation protection programs required by § 835.101.	Article 711 Article 712.1	Article 712.3	
(b) Unless otherwise specified in this subpart, records shall be retained until final disposition is authorized by DOE.	Article 774.1	Article 712.3 Article 771 - 775	
§ 835.702 Individual monitoring records.			
(a) Records shall be maintained to document doses received by all individuals for whom monitoring was required pursuant to § 835.402 and doses received during planned special exposures, accidents, and emergency conditions.	Article 712.1.c Article 722.1, 3 & 12 Article 723.1 Article 731.2		
(b) The results of individual external and internal dose measurements that are performed, but are not required by § 835.402, shall be recorded. Recording of the non-uniform shallow dose equivalent to the skin caused by contamination on the skin (see § 835.205) is not required if the dose is less than 2 percent of the limit specified for the skin in § 835.202(a)(4).	Article 722.1, 3 & 13		

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
(c) The records required by this section shall:			
(1) Be sufficient to evaluate compliance with § 835.202;	Article 722.1		
(2) Be sufficient to provide dose information necessary to complete reports required by subpart I of this part and by Departmental requirements for occurrence reporting and processing;	Article 712.1 Article 722.1 Article 723 Article 732 Article 781		
(3) Include the following quantities for external dose received during the year: (i) The effective dose equivalent from external sources of radiation (deep dose equivalent may be used as effective dose equivalent for external exposure); (ii) The lens of the eye dose equivalent; (iii) The shallow dose equivalent to the skin; and (iv) The shallow dose equivalent to the extremities.	Article 722.4.a	Glossary: total effective dose equivalent	
(4) Include the following quantities for internal dose resulting from intakes received during the year: (i) Committed effective dose equivalent; (ii) Committed dose equivalent to any organ or tissue of concern; and (iii) Estimated intake and identity of radionuclides.	Article 722.5	Article 722.6	
(5) Include the following quantities for the summation of the external and internal dose:			
(i) Total effective dose equivalent in a year;	Article 722.7		
(ii) For any organ or tissue assigned an internal dose during the year, the sum of the deep dose equivalent from external exposures and the committed dose equivalent to that organ or tissue; and	Article 722.6		
(iii) Cumulative total effective dose equivalent received from external and internal sources while employed at the site or facility, since January 1, 1989.	Article 722.9		
(6) Include the dose equivalent to the embryo/fetus of a declared pregnant worker.	Article 722.8		

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
(d) Documentation of all occupational exposure received during the current year shall be obtained when demonstrating compliance with § 835.202(a). In the absence of formal records of previous occupational exposure during the year, a written estimate signed by the individual may be accepted.	Article 213.1 & 2 Article 722.1		
(e) Efforts shall be made to obtain records of prior years occupational internal and external exposure.	Article 721		
(f) The records specified in this section that are identified with a specific individual shall be readily available to that individual.	Article 712.4 Article 781.1		
(g) Data necessary to allow future verification or reassessment of the recorded doses shall be recorded.	Article 722.3		
(h) All records required by this section shall be transferred to the DOE upon cessation of activities at the site that could cause exposure to individuals.	Article 774.1		
§ 835.703 Monitoring and workplace records.			
The following information shall be documented and maintained:			
(a) Results of surveys for radiation and radioactive material in the workplace as required by §§ 835.401, 835.403, and 835.404;	Article 751.1 Article 752.1 Article 753.1 Article 754.1	Article 421.5 Article 712.1 Article 713	
(b) Results of surveys, measurements, and calculations used to determine individual occupational exposure from external and internal sources;	Article 722.4 & 5 Article 752 Article 753	Appendix 2C Article 541 Article 542 Article 713	
(c) Results of surveys for the release of material and equipment as required by § 835.1101(d); and	Article 421.5	Article 754	
(d) Results of maintenance and calibration performed on: (1) Instruments used for area monitoring and contamination control as required by § 835.401; and (2) Devices used for individual monitoring as required by §§ 835.401 and 835.402	Article 761.1, 2 & 4	Article 562.2 Article 564.1.d	

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
§ 835.704 Administrative records.			
(a) Training records shall be maintained, as necessary, to demonstrate compliance with §§ 835.901, 835.902, and 835.903.	Article 725.4	Article 725 Article 731	
(b) Actions taken to maintain occupational exposures as low as reasonably achievable, including the actions required for this purpose by § 835.101, as well as facility design and control actions required by §§ 835.1001, 835.1002, and 835.1003, shall be documented.	Article 742	Article 138 Article 312 - 316 Article 321 Article 324.5 Article 531	
(c) Records shall be maintained to document the results of internal audits and other reviews of program content and implementation.	Article 743		
(d) Written declarations of pregnancy shall be maintained.	Article 723.3		
(e) Changes in equipment, techniques, and procedures used for monitoring in the workplace shall be documented.	Article 551.4 Article 553.3	Article 562.2 Article 564.1.d	
Subpart I--Reports to Individuals **§ 835.801 Reports to individuals.**			
(a) Radiation exposure data for individuals monitored in accordance with § 835.402 shall be reported as specified in this section. The information shall include the data required under § 835.702(c). Each notification and report shall be in writing and include: the DOE site or facility name, the name of the individual, and the individual's social security number or employee number.	Article 781		
(b) Upon the request from an individual terminating employment, records of exposure shall be provided to that individual as soon as the data are available, but not later than 90 days after termination. A written estimate of the radiation dose received by that employee based on available information shall be provided at the time of termination, if requested.	Article 781.2	Article 781.1 & 3	
(c) Each DOE- or DOE-contractor-operated site or facility shall, on an annual basis, provide a radiation dose report to each individual monitored during the year at that site or facility in accordance with § 835.402.	Article 781.1		

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
(d) Detailed information concerning any individual's exposure shall be made available to the individual upon request of that individual, consistent with the provisions of the Privacy Act (5 U.S.C. 552a).	Article 712.4	Article 711 Article 781.1	
(e) When a DOE contractor is required to report to the Department, pursuant to Departmental requirements for occurrence reporting and processing, any exposure of an individual to radiation and/or radioactive material, or planned special exposure in accordance with § 835.204(e), the contractor shall also provide that individual with a report on his or her exposure data included therein. Such report shall be transmitted at a time not later than the transmittal to the Department.	Article 781.4		
Subpart J--Radiation Safety Training **§ 835.901 General employees.**	Chapter 6 (Additional, specific cross-references noted below)		
(a) All general employees shall be trained in radiation safety prior to receiving occupational exposure during access to controlled areas at a DOE site or facility. Allowance may be made for previous DOE training on generic radiation safety topics (i.e., those not specific to a site or facility), provided the training was received at another DOE site or facility within the past 2 years. Documentation of the previous training shall clearly identify the individual's name, date of training, topics covered, and name of the certifying individual. The knowledge of radiation safety possessed by general employees shall be verified by examination.	Article 331 Article 612.3 Article 613.1, 3 & 5 Article 621	Article 612 Article 613 Article 616 Article 661 - 664	
(b) Retraining shall be provided when there is a significant change to radiation protection policies and procedures that affect general employees and shall be conducted at intervals not to exceed 2 years.	Article 613.3		

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
§ 835.902 Radiological workers.			
Radiological worker training programs and retraining shall be established and conducted at intervals not to exceed 2 years to familiarize the worker with the fundamentals of radiation protection and the ALARA process. Training shall include both classroom and applied training. Training shall either precede assignment as a radiological worker or be concurrent with assignment as a radiological worker if the worker is accompanied by and under the direct supervision of a trained radiological worker. Radiological worker training not specific to a given site or facility may be waived provided that: this training has been received at another DOE site or facility within the past 2 years; there is provision of proof-of-training in the form of a certification document containing the individual's name, date of training, and specific topics covered; and an appropriate official has certified the training of the individual. The knowledge of radiation safety possessed by radiological workers shall be verified by examination prior to an unsupervised assignment. The training shall include procedures specific to an individual's job assignment. The level of training is to be commensurate with each worker's assignment.	Article 612.3 Article 613.1 & 4 Article 614.5 Article 631 Article 632.1 & 3 Article 633	Article 612 Article 613 Article 616 Article 631 - 634 Article 651 - 657 Article 661 - 664	
§ 835.903 Radiological control technician.			
Training and retraining programs for radiological control technicians shall be established and conducted at intervals not to exceed 2 years to familiarize technicians with the fundamentals of radiation protection and the proper procedures for maintaining exposures ALARA. This program shall include both classroom and applied training. The training shall either precede performance of tasks assigned to radiological control technicians or be concurrent with such task assignments if the individual is accompanied by and under the direct supervision of a trained individual. The required level of knowledge of radiation safety possessed by radiological control technicians shall be verified by examination to include demonstration prior to any unsupervised work assignment. The training program shall include procedures specific to the site or facility where the technician is assigned. The level of training shall be commensurate with the technician's assignment. Allowance may be made for previous DOE training on generic radiation safety topics (i.e., those not specific to a site or facility), provided the training was received within the past 2 years. Documentation of the previous training shall clearly identify the individual's name, date of training, topics covered, and name of the certifying individual.	Article 612.3 Article 613.1 Article 614.3 - 5 Article 641 Article 642.1 Article 643.2	Article 612 - 616 Article 641 - 645 Article 656 Article 661 - 664	
Subpart K--Design and Control **§ 835.1001 Design and control.**			

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
(a) Measures shall be taken to maintain radiation exposure in controlled areas as low as is reasonably achievable through facility and equipment design and administrative control. The primary methods used shall be physical design features (e.g., confinement, ventilation, remote handling, and shielding). Administrative controls and procedural requirements shall be employed only as supplemental methods to control radiation exposure.	Article 311 Article 316.1 & 2	Article 337.4 Article 342.4 Article 531.1 & 6	
(b) For specific activities where use of physical design features are demonstrated to be impractical, administrative controls and procedural requirements shall be used to maintain radiation exposures ALARA.	Article 311 Article 316.2	Article 312.4 - 6 Article 313 Article 315 Article 316.2 Article 321 Article 334.10 Article 335.8 Article 531.1 & 6	
§ 835.1002 Facility design and modifications.			
During the design of new facilities or modification of old facilities, the following objectives shall be adopted:			
(a) Optimization methods shall be used to assure that occupational exposure is maintained ALARA in developing and justifying facility design and physical controls.	Article 128.1.a Article 312.7	Article 311 Article 312.1, 4 & 7 Article 314	
(b) The design objective for controlling personnel exposure from external sources of radiation in areas of continuous occupational occupancy (2000 hours per year) shall be to maintain exposure levels below an average of 0.5 mrem (5 microsieverts) per hour and as far below this average as is reasonably achievable. The design objectives for exposure rates for potential exposure to a radiological worker where occupancy differs from the above shall be ALARA and shall not exceed 20 percent of the applicable standards in § 835.202.	Article 128.1.a	Article 311 Article 312.1, 4 & 7 Article 314	
(c) Regarding the control of airborne radioactive material, the design objective shall be, under normal conditions, to avoid releases to the workplace atmosphere and in any situation, to control the inhalation of such material by workers to levels that are ALARA; confinement and ventilation shall normally be used.	Article 316.1 Article 371	Article 311 Article 312.1, 4 & 7 Article 531.1 & 6	
(d) The design or modification of a facility and the selection of materials shall include features that facilitate operations, maintenance, decontamination, and decommissioning.	Article 128.1.d Article 311		

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
§ 835.1003 Control procedures.			
(a) During routine operations, the combination of design features and administrative contro procedures shall provide that:			
(1) The anticipated magnitude of the total effective dose equivalent shall not exceed 5 rems (0.05 sievert) in a year;	Article 211.2 Article 213.1	Article 128.1 Article 211.2 - 4 Article 213	
(2) The anticipated magnitude of the committed dose equivalent to any organ or tissue, plus any deep dose equivalent from external exposure, shall not exceed 50 rems (0.5 sievert) in a year; and	Article 213.1	Article 128.1 Article 136 Article 316	
(3) Exposure levels are as low as reasonably achievable.	Article 111	Article 128.1 Article 312, 312.1 & 4	
(b) Compliance with the requirements in paragraph (a) of this section shall be demonstrated by appropriate monitoring pursuant to the provisions of subpart E.	Article 511.1 Article 514.1 Article 521.1 Article 551.1	Article 344.3	

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10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
Subpart L--Releases of Materials and Equipment from Radiological Areas **§ 835.1101 Releases of materials and equipment from radiological areas.**			
The following requirements apply for the release of materials and equipment from radiological areas for use in controlled areas:			
(a) In radiological areas established to control surface or airborne radioactive material, material and equipment shall be treated as radioactive material and shall not be released from radiological areas to controlled areas if either of the following conditions exist:	Article 411.1 Article 421.1	Article 335.7	
(1) Measurements of accessible surfaces show that either the total or removable contamination levels exceed the values specified in appendix D to this part; or	Article 421.1	Article 335.7	
(2) Prior use suggests that the contamination levels on inaccessible surfaces are likely to exceed the values specified in appendix D to this part.	Article 554.4	Article 335.7	
(b) Material and equipment exceeding the total or removable contamination levels specified in appendix D to this part may be conditionally released for movement on-site from one radiological area for immediate placement in another radiological area only if appropriate monitoring and control procedures are established and exercised.	Article 413.1 Article 421.2 & 3 Article 423.3 & 4	Article 413	
(c) Material and equipment with fixed contamination levels that exceed the limits specified in appendix D of this part may be released for use in controlled areas outside of the radiological areas with the following provisions: (1) Removable contamination levels are below the level specified in appendix D of this part; and (2) Materials shall be routinely monitored, clearly labeled, or tagged to alert personnel of the contaminated status; appropriate administrative procedures shall be established and exercised to maintain control of these items.	Article 411.1 Article 412.1 - 5 Article 413.1, 3 & 4 Article 421.2 & 3 Table 4-1	Article 335.7 Article 413	
(d) The records for release of material and equipment shall describe the property, date on which the release survey was performed, identity of the individual who performed the survey, type and identification number of the survey instrument used, and results of the survey.	Article 421.5	Article 751 Article 754	
Subpart N--Accidents and Emergencies **§ 835.1301 General provisions.**			

APPENDIX A
Cross-Reference of 10 CFR 835 to Site-Specific Provisions and to the DOE Radiological Control Manual

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
(a) A general employee whose occupational exposure has exceeded any of the limits specified in §§ 835.202 or 835.205 may be permitted to return to work in radiological areas during the current year providing that all of the following conditions are met:			
(1) Approval is first obtained from the contractor management and the Head of the responsible DOE field organization;			
(2) The individual receives counseling from radiological protection and medical personnel regarding the consequences of receiving additional occupational exposure during the year; and		Article 124 Article 722.10	
(3) The affected employee agrees to return to radiological work.			
(b) All exposures exceeding the limits specified in §§ 835.202 or 835.205 shall be recorded in the affected individual's occupational exposure file and reported to the DOE in accordance with Departmental requirements for occurrence reporting and processing.	Article 722.1 & 12 Article 781.4	Article 723.1	
(c) When the conditions under which the emergency or accident exposures were received have been eliminated, operating management shall notify the Head of the responsible DOE field organization.			
(d) Operations after an emergency or accidental exposure in excess of the limits specified in §§ 835.202 or 835.205 may be resumed only with the approval of the DOE.			
(e) Occurrence reports to DOE regarding emergencies and/or accidents shall be prepared and submitted in accordance with Departmental requirements for occurrence reporting and processing.	Article 712.1.n Article 781.4		

APPENDIX A
Cross-Reference of 10 CFR 835 to Site-Specific Provisions and to the DOE Radiological Control Manual

<table>
<tr><th>COLUMN 1</th><th>COLUMN 2</th><th>COLUMN 3</th><th>COLUMN 4</th></tr>
<tr><th>10 CFR Part 835</th><th>DOE RCM
Direct References</th><th>DOE RCM
Supporting
References</th><th>Site-Specific Provision
(e.g., Site RCM or
Procedure)</th></tr>
<tr><td>§ 835.1302 Emergency exposure situations.</td><td></td><td></td><td></td></tr>
<tr><td>(a) The risk of injury to those individuals involved in rescue and recovery operations shall be minimized.</td><td>Appendix 2A</td><td>Article 346</td><td></td></tr>
<tr><td>(b) Operating management shall weigh actual and potential risks to rescue and recover individuals against the benefits to be gained.</td><td>Appendix 2A</td><td>Article 346</td><td></td></tr>
<tr><td>(c) Rescue action that might involve substantial personal risk shall be performed by volunteers.</td><td>Appendix 2A</td><td>Article 346</td><td></td></tr>
<tr><td>(d) The dose limits for individuals performing these operations are as follows:
Guidelines for Control of Emergency Exposures
<table>
<tr><th>DOSE LIMIT[1]
(Whole Body)</th><th>ACTIVITY PERFORMED</th><th>CONDITIONS</th></tr>
<tr><td>5 rems</td><td>All</td><td></td></tr>
<tr><td>10 rems</td><td>Protecting major property</td><td>Where lower dose limit not practicable</td></tr>
<tr><td>25 rems</td><td>Lifesaving or protection of large populations</td><td>Where lower dose limit not practicable</td></tr>
<tr><td>>25 rems</td><td>Lifesaving or protection of large populations</td><td>Only on a voluntary basis to personnel fully aware of the risks involved</td></tr>
</table>
[1] The lens of the eye dose limit is three times the listed values. The shallow dose limit to the skin of the whole body and the extremities is ten times the listed values. These doses are in addition to and accounted for separately from the doses received under the</td><td>Appendix 2A</td><td></td><td></td></tr>
<tr><td>(e) Each individual selected shall be trained in accordance with § 835.902 and briefed beforehand of the known or anticipated hazards to which the individual will be subjected</td><td>Article 643.6
Article 656.2 & 3</td><td>Appendix 2A
Article 722.10</td><td></td></tr>
</table>

APPENDIX A
Cross-Reference of 10 CFR 835 to Site-Specific Provisions and to the DOE Radiological Control Manual

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
§ 835.1304 Nuclear accident dosimetry.			
(a) Installations possessing sufficient quantities of fissile material to potentially constitute a critical mass, such that the excessive exposure of personnel to radiation from a nuclear accident is possible, shall provide nuclear accident dosimetry for those personnel.		Article 515	
(b) Nuclear accident dosimetry shall include the following:			
(1) A method to conduct initial screening of personnel involved in a nuclear accident to determine whether significant exposures to radiation occurred;		Article 515	
(2) Methods and equipment for analysis of biological materials;		Article 515	
(3) A system of fixed nuclear accident dosimeter units; and		Article 515	
(4) Personal nuclear accident dosimeters worn by all personnel who enter locations in which installed criticality alarm systems are required.		Article 515	
Appendix A to Part 835 - Derived Air Concentrations (DAC) for Controlling Radiation Exposure to Workers at DOE Facilities			
To allow for an actual measured equilibrium concentration or a demonstrated equilibrium concentration, the values given in this table should be multiplied by the ratio (100%/actual %) or (100%/demonstrated %), respectively.		Glossary: derived air concentration (DAC)	
Alternatively, the DAC values for Rn-220 and Rn-222 may be replaced by 1 WL and 1/3 WL, respectively, for appropriate limiting of daughter concentrations.		Glossary: derived air concentration (DAC)	
Appendix B to Part 835 - Alternative Absorption Factors and Lung Retention Classes for Specific Compounds			

APPENDIX A
Cross-Reference of 10 CFR 835 to Site-Specific Provisions and to the DOE Radiological Control Manual

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
10 CFR Part 835	**DOE RCM Direct References**	**DOE RCM Supporting References**	**Site-Specific Provision (e.g., Site RCM or Procedure)**
Appendix C to Part 835 - Derived Air Concentrations (DAC) for Workers from External Exposure During Immersion in a Contaminated Atmospheric Cloud			
The DAC values are given for individual radionuclides. For known mixtures of radionuclides, the sum of the ratio of the observed concentration of a particular radionuclide and its corresponding DAC for all radionuclides in the mixture must not exceed 1.0. For unknown radionuclides, the most restrictive DAC (lowest value for those isotopes not known to be absent) shall be used.		Glossary: derived air concentration (DAC)	
Appendix D to Part 835 - Surface Radioactivity Values			
Footnote 1: Where surface contamination by both alpha and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.	Table 2-2, Note 1		
Footnote 3: The levels may be averaged over one square meter provided the maximum surface activity in any area of 100 cm^2 is less than three times the value specified. For purposes of averaging, any square meter of surface shall be considered to be above the activity guide G if: (1) From measurements of a representative number n of sections it is determined that $1/n \Sigma_n S_i \geq G$, where S_i is the dpm/100 cm^2 determined from measurement of section i; or (2) it is determined that the sum of the activity of all isolated spots or particles in any 100 cm^2 area exceeds 3G.	Table 2-2, Note 3		
Footnote 4: The amount of removable radioactive material per 100 cm^2 of surface area should be determined by swiping the area with dry filter or soft absorbent paper, applying moderate pressure, and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. (Note - The use of dry material may not be appropriate for tritium.) When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped.	Table 2-2, Note 2	Article 554.7 & 8	

UNITED STATES
DEPARTMENT OF ENERGY

Office of Health Physics and Industrial Hygiene (EH-41, 270 CC/GTN)
Washington DC 20585

REQUEST FOR CHANGES TO IMPLEMENTATION GUIDE ON
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(Use Multiple Pages as Necessary)

Page No. _____ Column No. _____ Line No. _____	_____ Facility Requesting Change _____ Contact Person _____ Telephone Number - Fax Number

Description of Change Request:

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Suggested Specific Word Changes:

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EH-411 Guidance Program Contact: David M. Rohrer, (301) 903-3658